CENG315 COMPUTER GRAPHICS ASSIGNEMENT 5

BLENDER AND THREEJS

Team Members:

- **Selçuk Üstün (20050111072) - Giraffe**
- **Talha Ubeydullah Gamga (20050111078) – Zebra**

Part 1: 3D Animal Models

Models Created:

1. **Giraffe (Selçuk Üstün):**
    - Designed using Blender, exported as .obj format.
    - Texture applied: A realistic giraffe texture using UV mapping.
    - My initials "SU" are embossed in relief on the place where the foot and neck of the giraffe model meet.

2. **Zebra (Talha Ubeydullah Gamga):**
    - Designed using Blender, exported as .fbx format.
    - Texture applied: Striped zebra texture.
    - The model's necklace has the personal initials "GMG" visibly added to his last name.

Challenges in Modeling:

Creating detailed UV maps for both animals was time-intensive, particularly for ensuring that the textures were not distorted during application. Additionally, simplifying the models for better performance in Three.js required careful optimization without compromising the visual quality. Blender's tools for reducing the number of polygons were extensively used to meet performance requirements.

Part 2: Three.js Application

The second part of the assignment involved enhancing an existing Three.js scene by integrating and animating the animal models.

Initial Scene Overview:

The base scene, provided as a starting point, already included:

- A textured grass floor, which served as the primary ground for the environment.
- A transparent water section to simulate a natural environment.
- Static objects, including a tree, electricity poles, and a ball with a predefined bouncing animation.

Contributions and Enhancements:

Our primary focus was on integrating the animal models, adding interactive and dynamic animations, and applying textures for enhanced realism.

1. **Animal Integration:**
    - The giraffe and zebra models were imported into the scene using OBJLoader and FBXLoader.

- Both models were carefully scaled and positioned to fit naturally within the environment. Their placements were adjusted to avoid interference with existing scene objects, such as the tree and water.

2. **Animations:**
    - **Zebra:**
        - Moved along a Catmull-Rom spline curve, simulating natural movement through predefined waypoints.
        - A jump animation was added, triggered by the **spacebar**. When pressed, the zebra halts its movement, performs a jump, and then smoothly resumes moving along the spline curve.
    - **Giraffe:**
        - Moved back and forth along the Z-axis, adding a sense of life to the scene.
        - When the user **left-clicks the mouse**, the giraffe temporarily stops its movement, rotates 360 degrees around its own axis, and then resumes its Z-axis movement.
3. **Texture Application:**
    - High-quality, custom-designed textures were applied to both models to enhance their appearance.
    - The UV-mapped giraffe and zebra textures were loaded using TextureLoader and integrated seamlessly with the models.
4. **Interactivity:**
    - Clicking on the giraffe initiates its rotational animation, providing dynamic user interaction.
    - The zebra's jumping animation responds to keyboard input, specifically the spacebar, creating an engaging interaction.

Technical Highlights

1. **Spline Animation:**
    - The zebra's movement along the Catmull-Rom spline curve was implemented to mimic natural roaming behavior. The curve smoothly transitions between predefined points, ensuring realistic motion. This type of animation allowed the zebra to traverse the scene in a fluid and non-linear manner.

2. **Interactive Features:**
    - The giraffe's ability to temporarily halt, rotate, and resume movement adds depth to the interactivity of the scene. Similarly, the zebra's jump animation triggered by the spacebar enriches the scene's dynamism and user engagement. These interactive features demonstrate how animations can be tied to user input for enhanced experiences.
3. **Texture Mapping:**
    - Both the giraffe and zebra textures were designed to align perfectly with their respective UV maps. This process ensured that the animals' appearances were visually accurate and immersive.
4. **Collision-Free Motion:**
    - Careful placement of the animals and animations avoided any interference with the pre-existing scene elements, such as the tree and water.

Challenges Faced

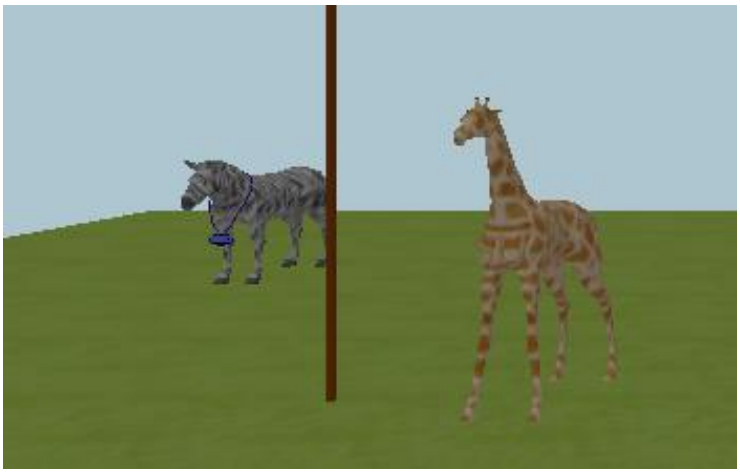
1. **UV Mapping and Textures:**
   Aligning textures to match the contours of the animal models was a meticulous process, requiring multiple iterations to ensure accuracy.
2. **Spline Curve Animation:**
   Fine-tuning the zebra's movement along the spline was challenging, particularly in maintaining smooth transitions at curve endpoints.
3. **Performance Optimization:**
   Simplifying the high-polygon models without losing detail required careful consideration, as overly complex models could hinder the real-time rendering performance in Three.js.

Time Allocation

- Texture Application: ~5,5 - 6 hours.
- Animation Development: ~3 hours.
- Scene Integration and Testing: ~2 hours.

Screenshots

The giraffe and zebra with their textures.



The overall updated scene.

Video containing the general functioning of the scene and the movements of the models.

(https://youtu.be/uGaUo8jl55Y)

Conclusion

This assignment allowed us to explore the integration of 3D models into an interactive Three.js environment. By focusing on model animations, texturing, and user interactivity, we were able to enhance the pre-existing scene and meet all the assignment requirements. The interactive features, including the giraffe's rotation and the zebra's jump, added depth to the project, demonstrating the effective use of Blender and Three.js together. This project provided valuable insight into real-time 3D scene creation and the seamless blending of animation with user interaction.